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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/679,023 | 10/04/2000 | Xiao-Bo Wang | 471842000200 | 5573 |

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MORRISON & FOERSTER LLP
3811 VALLEY CENTRE DRIVE
SUITE 500
SAN DIEGO, CA 92130-2332

EXAMINER

BROWN, JENNINE M

| ART UNIT | PAPER NUMBER |
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1743

DATE MAILED: 10/22/2002

9

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/679,023

Applicant(s)

WANG ET AL.

Examiner

Jennine M. Brown

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-78 is/are pending in the application.
- 4a) Of the above claim(s) 1-24 and 51-64 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 25-50 and 65-78 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-24 and 51-64, drawn to Method and Apparatus for Acoustic Force Field Flow Fractionation, classified in class 435, subclass 289.1.
- II. Claims 25-50 and 65-78, drawn to Method and Apparatus for Electrophoretic and Acoustic Force Field Flow Fractionation, classified in class 204, subclass 600.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because Invention I does not require the electrophoresis electrodes as claimed in Invention II. The subcombination has separate utility such as Water Purification.

Because these inventions are distinct for the reasons given above and the search required for Group II is not required for Group I, restriction for examination purposes as indicated is proper.

During a telephone conversation with Peng Chen on 10/11/02 a provisional election was made without traverse to prosecute the invention of Invention II, claims 25-50 and 65-78. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-24 and 51-64 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below.

Authorization for this examiner's amendment was given in a telephone interview with Peng Chen on 10/11/02.

The application has been amended as follows:

Claims 1-24 and 51-64 are cancelled.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The term "comprises" is inclusive and fails to exclude unrecited steps. In re Horvitz, 168 F 2d 522, 78 USPQ 79 (CCPA 1948). The use of the term "comprising" to

introduce the claimed structure means that the device covered by these claims may involve many more elements than those positively recited. Ex parte Gottzein et al., 168 USPQ 176 (PTO Bd. App. 1969). "Consisting" in a claim is construed as definitely excluding therefrom any element not specified therein. In re Gray, 53 F 2d 520, 11 USPQ 255 (CCPA 1931). "Consisting essentially of" limits the scope of a claim to the specified ingredients and those that do not materially affect the basic novel characteristics of a composition. Ex parte Davis, supra.

Claims 42, 43, 49 and 50 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants use "consists essentially of" or "consists of" in the claim preamble which are regarded as closed language to describe the apparatus yet Applicants also use "at least" in the claim which is regarded as open language to describe inlet and outlet ports, electrode elements, electrical signals, electrophoretic force, piezoelectric transducer and acoustic force which all materially affect the basic novel characteristics of the apparatus.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 25-50 and 65, 68-69, 72 and 75-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker, et al. (US 5888370) in view of Cannon, et al. (US 5245290).

Regarding apparatus claims 25-50, Becker et al. teach an apparatus that uses electrophoretic and acoustic forces in field flow fractionation. Becker, et al. teach a chamber with at least one inlet port and at least one outlet port (col. 3, l. 26-28) with at least two electrode elements and preferably an electrode array disposed along a portion of the chamber energized by an electrical signal generator to create an electrical field to cause an electrophoretic force normal to the traveling direction of a carrier medium (col. 3, l. 49 – col. 4, l. 10, 35-40) whereby the chamber may be a tube (col. 28, l. 1-2). The AC signal generator can be connected to a plurality of electrical conductor buses connected to more than two individual electrode elements (col. 7, l. 16-36; col. 20, l. 34-56). Alternately, electrode elements can be adapted longitudinally or latitudinally along the inside or outside of the chamber whereby the array may be parallel, interdigitated, castellated, polynomial or plane (col. 4, l. 1-40, 47-50). Electrode

elements are made of metal layer(s) on the surface of the chamber, particularly gold and chromium (col. 7, l. 16-21; col. 20, l. 56-62). These elements create a spatially inhomogeneous electric field (col. 5, l. 9-20) to vary the magnitude and frequency of the electrical signals (col. 4, l. 64 – col. 5, l. 8).

Becker, et al. do not specifically teach one or more piezoelectric transducers. Cannon, et al. describe a method of generating acoustic waves by applying an inhomogeneous electric field using an array of electrodes measured by transducers (piezoelectric is a type of transducer) to determine particle charge and size distribution especially electrophoretic mobility of particles in suspension (abstract; col. 1, l. 12-18; col. 8, l. 11-16).

It would have been obvious to one of ordinary skill in the art to generate and measure an acoustic wave in the device and method of Becker, et al. in order to separate particles in suspension as well as measure particle characteristics, such as electrophoretic mobility, size and charge.

Regarding method claims 65, 68-69, 72 and 75-76 Becker et al. teach more than one method for using the apparatus detailed above. Becker teaches introducing a medium into the apparatus (Example I, col. 16, l. 16 – col. 17, l. 51) and into the chamber giving a velocity profile and applying at least one electrical signal to provide an electrophoretic force on the medium normal to the traveling direction of the carrier medium and a second electrical signal used to generate an acoustic wave to displace matter normal to the direction of the carrier medium.

Claims 66-67, 70-71, 73-74 and 77-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker, et al. (US 5888370) in view of Cannon, et al. (US 5245290) and further in view of Yasuda, et al. (US 6216538).

Becker, et al. in view of Cannon, et al. teaches a method and apparatus for electrophoretic and acoustic manipulation of a sample as described previously. Becker, et al. do not specifically teach simultaneous or sequentially generated acoustic and electrophoretic forces.

Yasuda, et al. teach simultaneously generated acoustic and electrophoretic forces (col. 15, l. 43 – col. 16, l. 4) to create defined separation band areas normal to the flow of sample on an electrophoretic gel so that transverse band broadening of the sample as it is electrophoretically separated does not occur, therefore samples do not bleed together on the plate. If the acoustic wave is used transverse to the flow, the sample will become stacked and when the acoustic component is shut off, the sample can then be electrophoretically separated so that sample dilution does not occur.

It would have been obvious to one of ordinary skill in the art to use simultaneously generated acoustic and electrophoretic forces to separate particles not only based upon charge and size but also based upon acoustic velocity because neutral particles will also be detected and separated out by size depending on the amplitude and frequency of the acoustic signal. If the signal is generated sequentially, one can provide either electrophoretic or acoustic forces at alternating intervals to concentrate

the particles like in electrophoretic sample stacking and then separate the sample so that a small sample population does not get diluted.

Relevant Prior Art of Record

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 6,246,046 teaches a method and apparatus for electrically controlled scanning of a microchannel device on a chip using electrooptical scanning where acoustooptic devices use piezoelectric transducers driven by an RF signal. The spatially periodic density variations in the material corresponding to compressions and traveling acoustic wave are accompanied by changes in the index of propagation of light in the medium for laser beam scanning. AC or DC signals are used for manipulation of the electrodes.

US 6,372,506 teaches a method and apparatus for cytometry using static electrodes and piezoelectric transducers to vibrate the flow cell to separate the flow droplets to affect cell sorting.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennine M. Brown whose telephone number is (703) 305-0435. The examiner can normally be reached on M-F 8:00 AM - 4:30 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (703) 308-4037. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 879-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jmb
October 21, 2002


Jill Warden
Supervisory Patent Examiner
Technology Center 1700